Human Biology

Unit: F222: Growth, Development and Disease: Medium banded candidate style answer.

Introduction

OCR has produced these candidate style answers to support teachers in interpreting the assessment criteria for the new GCE specifications and to bridge the gap between new specification release and availability of exemplar candidate work.

This content has been produced by senior OCR examiners, with the input of Chairs of Examiners, to illustrate how the sample assessment questions might be answered and provide some commentary on what factors contribute to an overall grading. The candidate style answers are not written in a way that is intended to replicate student work but to demonstrate what a "good" or "excellent" response might include, supported by examiner commentary and conclusions.

As these responses have not been through full moderation and do not replicate student work, they have not been graded and are instead, banded "good" or "excellent" to give an indication of the level of each response.

Please note that this resource is provided for advice and guidance only and does not in any way constitute an indication of grade boundaries or endorsed answers.

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1 This question is based on the advance notice material 'MISTLETOE AND MEDICINE' (Advance Notice 1)

(a) **Plants such as the mistletoe plant are valued as a source of medicines.**
Give three ways in which the structure and chemical composition of a plant cell, such as a cell from a mistletoe leaf, differs from an animal cell such as a phagocyte.

[3]

Candidate style answer	Examiner's commentary
Plant cells have a cell wall and a vacuole as well as chloroplasts. Animal cells do not have any of these structures inside them.	This candidate has made a fair attempt at stating three differences between plant and animal cells but does not score full marks as they fail to provide sufficient detail: cellulose cell wall and permanent / large vacuole.

(b) **Plant extracts, such as Iscador from mistletoe plants, have been widely used as part of complementary or alternative medicine in the treatment of cancers.**

Give one example of complementary or alternative therapy other than plant extracts which can be used in cancer treatment. **[1]**

Candidate style answer	Examiner's commentary
hypnotherapy	Correct answer.

(c) You were told in the Advance Notice material that, in a report of the use of complementary or alternative medicine (CAM) by 453 cancer patients, 69% used at least one form of CAM treatment.

(i) Calculate the number of patients in this study who used at least one form of CAM treatment.
Show your working.

[2]

Candidate style answer	Examiner's commentary
$\dfrac{69}{100}$ **x 453 = 312.57** **Answer =.312.57 patients**	This gains basic marks for the correct use of methodology but fails to gain full mark as they have not given the answer to an appropriate level of precision. Only whole numbers are appropriate here as the number relates to the number of patients.

(ii) Suggest <u>one</u> reason why the results of trials on the success of CAM therapies may be unreliable.

[1]

Candidate style answer	Examiner's commentary
They are relatively new and we do not know what the long term effect will be.	Whilst this is not a suggested mark point on the mark scheme it is an appropriate suggestion to be credited for an AVP (alternative valid point) mark.

(d) The advance notice material suggests that one possible role of lectins in fighting cancer is to stimulate the immune system by activating cells such as macrophages and lymphocytes.

(i) State precisely where and in what form macrophages originate.

[1]

Candidate style answer	Examiner's commentary
They are made in the bone marrow as immature macrophages	The correct location has been identified but the candidate has failed to correctly identify the form in which macrophages originate. Both aspects of this were required to gain one mark and hence no marks can be supported for this question.

(ii) Complete the table which shows differences between macrophages and lymphocytes.
The first row has been done for you.

[2]

<table>
<tr><td colspan="3">Candidate style answer</td><td>Examiner's commentary</td></tr>
<tr><td></td><td>macrophage</td><td>lymphocyte</td><td rowspan="3">In the first row the candidate has got one answer wrong, but gets the 2nd row correct due to the 1st incorrect answer the candidate should not score full marks.</td></tr>
<tr><td>phagocytic</td><td>yes</td><td>no</td></tr>
<tr><td>bean shaped nucleus</td><td><i>yes</i></td><td><i>yes</i></td></tr>
</table>

makes antibodies	*no*	*yes*	

(e) **Explain how cancer develops** and **explain the role of lymphocytes in preventing cancer.**

🖊 **You should make clear in your answer the sequence of events leading to the development of cancer.**

[7]
[Total: 17]

Candidate style answer	*Examiner's commentary*
When the DNA is exposed to carcinogens then it can make oncogenes by a mutation. This means the cells will keep dividing even when they are not meant to which makes a tumor in the body. The cells will keep making more of themselves by mitosis. The lymphocytes are very important in preventing cancer as they are part of the immune system and they help protect us from diseases and pathogens. Others cells in our immune system are also important like phagocytes and platelets. Without all these cells doing their jobs correctly cancer can spread in the body and it can be fatal. Cancer can be stopped though if the tumor is cut out or sometimes the person has to go into hospital and have chemotherapy which makes them sick and lose their hair. This is why it is important that the lymphocytes do their job all the time in case a person gets cancer as this can stop it spreading and killing them	This candidate has made a good start at answering the question. There is good evidence of the cause of the development of a tumour so some mark points can be supported. As the candidate has not indicated that the <u>proto-oncogenes</u> become oncogenes, full marks could not be awarded. As is often seen in long answer questions, this candidate has failed to appreciate the requirement of the second aspect of the question. The question requires the details of the <u>role</u> of lymphocytes in preventing cancer. This candidate has incorrectly focussed on the wrong word in the stem of the question and given details on blood cells rather than the function of the lymphocytes. A technique which can help reduce this is to encourage candidates to circle the command word(s), such as 'Explain… and explain…' in this case. They could also then underline the detail of the question. E.g. **Explain** <u>how</u> cancer <u>develops</u> **and explain** the <u>role</u> of <u>lymphocytes</u> in preventing cancer. Candidates can be encouraged to write in bullet points and aim to provide at least the same number of bullet points as there are marks available.

2 This question is based on the article 'IMMUNISATION IN SCHOOL' (Advance Notice 2).

(a) You were told in the article that polio is caused by a virus, and diphtheria and tetanus by bacteria.

State which micro organism causes the following diseases.

[2]

Candidate style answer	Examiner's commentary
<table><tr><th>disease</th><th>microorganism</th></tr><tr><td>tuberculosis (TB)</td><td>*Bacteria*</td></tr><tr><td>rubella</td><td>*Virus*</td></tr></table>	The candidate has not answered the question properly. The question requires the name of each organism to be stated not the <u>type</u> of organism.

(b) Outline the meaning of the following terms used in the case study.

(i) notifiable disease

[1]

Candidate style answer	Examiner's commentary
This is a disease which has to be reported by the doctor to the WHO	Correct answer.

(ii) epidemic

[1]

Candidate style answer	Examiner's commentary
This means the disease has become a lot more common recently	No marks can be awarded, as the principle of a <u>sudden</u> increase has not been implied by the answer.

(iii) endemic

[1]

Candidate style answer	Examiner's commentary
This type of disease is always present in the country	Correct answer.

(iv) live vaccine

[1]

Candidate style answer	Examiner's commentary
This is an injection which is made from the weak form of the virus	Correct answer.

(c) Immunity can be active or passive and artificial or natural. In the following examples taken from the case study, identify the type of immunity achieved.

[1]

Candidate style answer			Examiner's commentary
example	type of immunity achieved		This is a good answer so would therefore score high marks.
receiving antibodies across the placenta	*Natural passive*		
receiving an anti-tetanus anti-toxin injection	*Artificial passive*		
picking up the polio virus from contaminated water	*Natural active*		

(d) In the article, Sarah explains what she means by herd immunity. In order to prevent transmission of measles occurring, it has been calculated that a herd immunity of 93 – 95% is required. Table 2.1 shows the percentage of the UK population aged 14 years and under who had received the measles vaccine by 1998 and 2003

Table 2.1

year	population 14 years and under / million	number vaccinated / million	% vaccinated / million
1998	11.2	10.2	91
2003	10.9	8.7	80

(i) Calculate how many children aged 14 and under would need to have been vaccinated by 2003 to achieve a herd immunity of 93%.
Show your working.

[2]

Candidate style answer	Examiner's commentary
0.93 x 10.9 = 10.137 **Answer =.. 10.137**	A error similar to that made in the first question has been made here, where the candidate has failed to give the answer to an appropriate level of precision. In this case, the candidate should look at the number of decimal places that are used in the data in the table and follow the same format. In this case the answer should be given to 1 decimal place.

(ii)   Suggest a reason for the decline in the number of children vaccinated against measles.

[1]
[Total: 13]

Candidate style answer	Examiner's commentary
Mums are scared that it may cause autism	This is a suitable answer.

3   Coronary heart disease (CHD) is one of the most common causes of premature death in the United Kingdom. Evidence has shown that a high level of saturated fat in the diet increases the risk of CHD.

(a)   Describe the events which occur in coronary arteries which can lead to the development of CHD.

[5]

Candidate style answer	Examiner's commentary
If a person has too much fatty food in their diet then they may end up with plaques building up in their blood vessels. Then atheromas may also form which can lead to CHD. If this occurs the lumen of the vessel gets smaller and this means less blood gets to the cells. They then get less oxygen and this may mean that they die. If this happens in the heart then the person will die as the heart will not be able to pump the blood around the body.	The candidate would be awarded some marks for this question. The candidate has stated the effect of an atheromas rather than sequencing the events that take place to lead to CHD. A useful revision suggestion is to ask students to make a 10-step flow diagram describing the stages of the lead up to a myocardial infarction. This could alternatively be done through the use of a card sort sequencing activity based on either text or images of the development of an atheromas (such as those found on websites such as those found on http://www.resverlogix.com/product_development/cardiovascular_disease/atherosclerosis.html

Table 3.1

country	deaths per 100 000
Ukraine	393.8
Romania	198.6
United Kingdom	150.4
Japan	35.7

b(i)   Suggest why the figures in table 3.1 are quoted as *deaths per 100 000*.

	[1]
Candidate style answer	*Examiner's commentary*
This means that the numbers can be compared between different countries if they have different numbers of people living there.	This answer is supported.

(ii)   Suggest with reasons <u>two</u> other types of data that could be collected in an epidemiological study on the possible causes of CHD in these countries.

One example has been done for you.

[4]
[Total: 10]

Candidate style answer			*Examiner's commentary*
	Data	**Quantity of dairy produce eaten in diet**	The second data that is suggested is insufficiently detailed enough to gain full marks (which looks for the quantity of cigarettes smoked).
	Reason	**Dairy products contain high levels of saturated fat and this increases the risk of CHD**	
	Data	**Sex**	
	Reason	**Men are more likely to get CHD than women as they tend to smoke more**	
	Data	**The number of smokers**	
	Reason	**If a person smokes more then they are more likely to get CHD than someone who only does passive smoking.**	

4   Fig 4.1 shows the mean weight (mass) in kilograms for boys and girls of different ages in 1994 and 2002 in the UK.
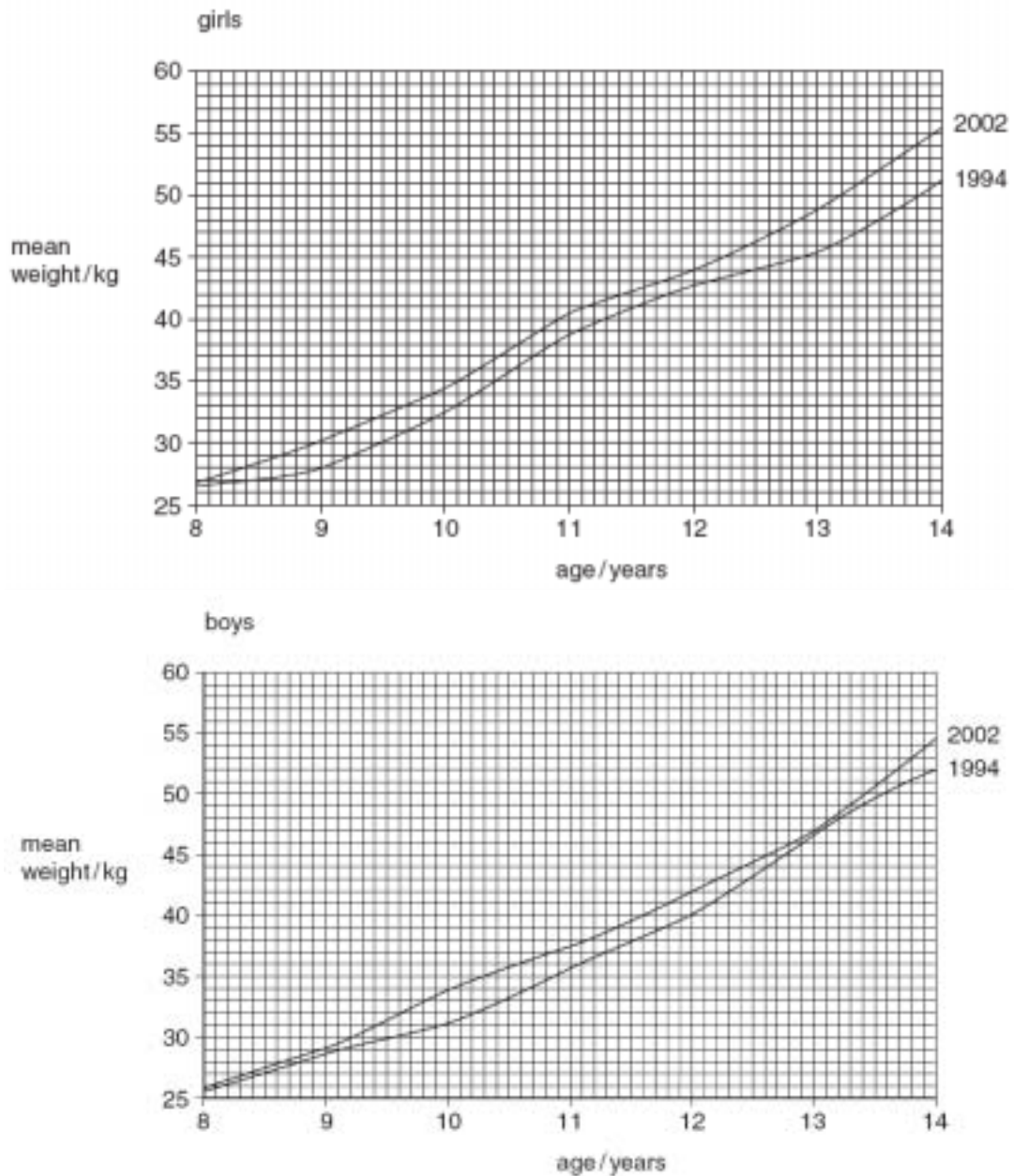

Fig 4.1

(a)(i) Identify two trends shown by the data for boys in Fig. 4.1.

[2]

Candidate style answer	Examiner's commentary
1 Boys get heavier as they get older *2 Boys are heavier overall in 2002 than in 1992*	Correct trends.

(ii) Suggest why girls tend to weigh more than boys at the age of 12 years.	
	[3]
Candidate style answer	Examiner's commentary

Girls mature earlier than boys as they get to puberty first. They store more fat on their hips whereas boys tend to get more muscle on their arms and shoulders. Boys also do more sport than girls so burn off more fat than the girls.	Correct answer

(iii) Suggest possible explanations for the changes seen in the mean weights of both **boys** and **girls** between 1994 and 2002.

[3]

Candidate style answer	Examiner's commentary
Nowadays people eat more food and eat more bad food such as MacDonalds and Pizza. This means they eat more than what people did a long time ago (1992) and so they put on more weight and then end up weighing more.	Some marks are awarded but the candidate repeats the same points and does not make three separate statements.

(b) Weight is also used to monitor <u>infant</u> growth rate.
State <u>one other</u> way in which infant growth rate can be monitored.

[1]

Candidate style answer	Examiner's commentary
Biparietal diameter	A common mistake by middle ability candidates is not appreciating the differences in techniques used to measure foetal growth and infant growth. No marks are awarded for this answer. A summary table identifying the different techniques and their procedures would aid revision. E.g.

Stage of development	Technique	Detail
Foetus	Biparetial diameter	
	Crown-rump length	
Infant	Head circumference	
	Height	

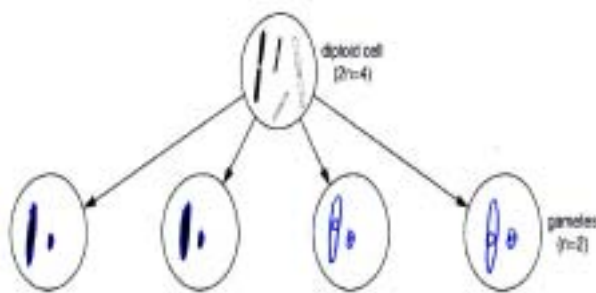**(c)** Describe how you would use weight measurements to calculate the relative growth rates of a child.

[3]
[Total: 12]

Candidate style answer	Examiner's commentary
A doctor should measure the weight of the child at the beginning of the week and then again at the end of the week. This then means he can work out how much weight the child has put on in the week. He can do this for a year to find out how much the weight the child has put on in the year. Then he can divide this by the weight the child had at the start of the year and this will tell him how much he has grown in the year compared to what he was at the start.	Although rather verbose, this answer would gain high marks. This is an area in which many candidates get the different types of growth curve muddled. Clear concise definitions and descriptions of how to achieve the data should be learnt, as well as how to interpret such data. Past exam questions can be found in unit 2857 papers (available from OCR publications department or through **www.ocr.org.uk**)

5(a) Fig. 5.1 shows a diploid cell with two pairs of chromosomes.

Compete the diagram to show the possible combinations of these chromosomes in the four gametes produced by meiosis.

[4]

Candidate style answer	Examiner's commentary
Fig. 5.1	This would score some marks.

(b) Explain how the process of meiosis can result in genetic variation.

[4]

Candidate style answer	Examiner's commentary
Meiosis is used to make cells divide. It is important in reproduction as it makes the gametes These only have 23 chromosomes in each gamete so when they are fertilised they go back to having 46 chromosomes.	This is a standard AS question and as such candidates should be able to list succinctly the areas in which variation is increased. This basic answer would gain a mark but there is insufficient detail to award any higher marks. Clear reference should be made to individual stages in meiosis and what occurs at the stages mentioned.

(c) Four light micrographs of onion cells undergoing mitosis **are shown in Fig. 5.2.**
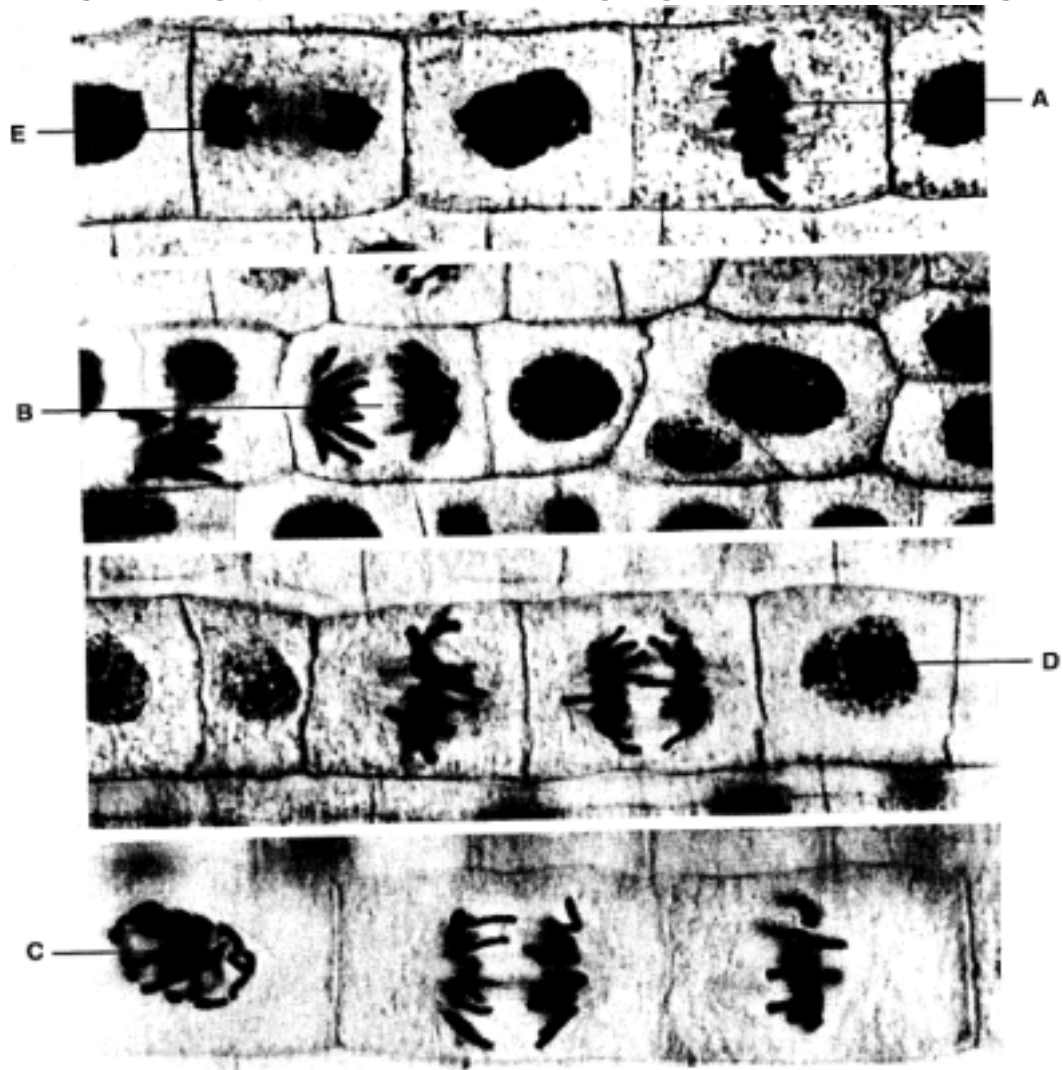

Fig. 5.2 © 2007 Manfred Kage/ Science Photo Library

Outline what happens to chromosomes during the mitotic cell cycle.
You will gain credit if you refer to the labelled cells A – E in Fig 5.2.

🖉 *You should make clear in your answer how the steps are sequenced.*

[10]
[Total: 17]

Candidate style answer	Examiner's commentary
Cell A shows a cell in metaphase and this is when the cell lets the chromosomes line up in the middle of the cell on the equator. They also have spindles attached to them. In cell B the cell is in a different stage of mitosis and this is a stage that occurs at the end of mitosis. This stage is called anaphase. It is when the chromosomes makes arrows and point to the edges of the nucleus. The arrows are made by the spindle fibres getting shorter. This then makes the chromosomes move to the edge of the nucleus so they get into 2	This candidate would be awarded middle level marks in this question: Some marks are not awarded as the description of the stage is incorrect (refer to marking guidance in italics at the top of the mark scheme for this question). Candidates often find it hard to remember the order of the stages in mitosis and the use of acronyms can help such as "I Prefer Marmite And Toasted Crumpets". Candidates can be encouraged to use side headings to help organise their answer and then bullet point features of each stage

groups rather than 1. Cell C is in prophase and is preparing to go through mitosis by making all their chromosomes fatter and shorter. This makes it look like a thick tumbled mess in the nucleus. As they are easier to see. The cell D is in prophase as well but is just a bit earlier as the chromosomes are not as thick yet. Cell E is two cells which are about to split into two. This is what mitosis is and helps make new cells for growth and repair. The cell and the chromosomes split so that they are equally split into two and are both the same at the end.	underneath e.g. Prophase – as seen in cell C *The chromosomes get shorter and thicker.* *This makes them more visible under the light microscope.* *Each chromosome is made up of two chromatids.* *They are joined together by a centromere.* A good revision activity is to provide candidates with a laminated work sheet of a diagram of empty cells in each stage of mitosis. Then using washable OHP pens ask candidates to work through the stages of mitosis drawing in nuclear envelope, chromosomes/chromatids, spindle fibres etc. A CD-ROM "Mitosis and Meiosis: An Interactive Approach, Third Edition" available from Illumination Educational Software which gives very clear animations on mitosis (and meiosis) and can be run as a revision exercise with tests at the end of each unit. Online activities can also be found on their website: http://www.illumination-ed.co.uk/

6   MRSA is a bacterium which can cause infections. There has been much publicity regarding the increased number of infections due to MRSA which occur in hospitals but data suggests that the number of cases may now be falling

(a)(i) State what the initials MRSA stand for.

[1]

Candidate style answer	*Examiner's commentary*
Multiple resistant Staphylocicos aurus	Although there are spelling errors within the answer, it is clear that the candidate has correctly identified the organism (as this is not a QWC question).

(ii) The following table compares some of the features of prokaryotic cells such as MRSA and eukaryotic cells such as a leucocyte.

Complete the table by placing a tick (✓) or a cross (x) in each box. The first one has been done for you.

[4]

Candidate style answer	*Examiner's commentary*
Complete the table by placing a tick (✓) or a cross (x) in each box. The first one has been done for you. <table><tr><td></td><td>prokaryotic cells</td><td>eukaryotic **animal** cells</td></tr><tr><td>DNA present</td><td>✓</td><td>✓</td></tr><tr><td>nuclear envelope (membrane) present</td><td>✓</td><td>✓</td></tr><tr><td>cell wall present</td><td>✓</td><td>✗</td></tr><tr><td>plasmids present in cytoplasm</td><td>✓</td><td>✗</td></tr><tr><td>naked DNA present</td><td>✓</td><td>✗</td></tr></table> [4]	The candidate has correctly completed the bottom 3 rows and would gain most marks.

(b) Outline **three** reasons which may explain the fall in the number of MRSA cases.

[3]

Candidate style answer	*Examiner's commentary*
1 *Doctors have found a new and better antibiotic which kills the disease* 2 *Doctors and nurses are using hand cleaning gel on wards all the time* 3 *Infected patients are kept away from other patients*	The first answer is superficial and incorrect but the other two statements would be credited. The first statement also implies a misunderstanding of the relationship between the terms pathogen/causative agent and disease.

(c) The presence of MRSA has been linked to the use of antibiotics.
Explain how the use of antibiotics has led to the development of MRSA.

[4]

Candidate style answer	*Examiner's commentary*
MRSA has been caused by doctors giving out too many antibiotics to people who did not need them. Also people start taking antibiotics and then when they start to feel better they get lazy and do not finish all their tablets. Also some people forget to take them. This means that the bacteria gets used to the antibiotic and learns how to survive. These super bacteria then keep growing and the person has more of them. If the person then coughs or sneezes over another person then they will now also have the super bacteria which can not be killed by the antibiotic.	This candidate has made a weak attempt at this question. Whilst the content is biologically sound in areas, the candidate has misinterpreted what the question has asked and hence scores no marks. Completing past papers can help candidates develop their answering technique considerably.

(d) The Millennium Seed Bank Project at Kew, near London, seeks to develop a global seed conservation network, capable of safeguarding wild plant species.

The project has focused its collecting priorities on the arid and semi-arid areas of the world. This is because nearly a fifth of the world's human population lives in such dry lands and is directly dependent upon the plants that grow there.

Explain why the project has concentrated on the arid and semi-arid areas of the world and discuss the possible advantages for people living in these areas of maintaining such a seed bank.

[6]

[Total: 18]

Candidate style answer	Examiner's commentary
The project is based in areas which have few plants and are very dry as these are people who can be helped more. As there are only a few plants which grow here the people only have a few crops that they can use and if these get diseased and die then there is even less. This will also get worse as the greenhouse effect gets worse. We may end up with arid areas in England as well so it is important to find plants which can survive. If we keep some of these seeds then if they die off in the other countries we will be able to sell the seeds back to them and make money to put into more research. We can also use special techniques to try and make different. plants breed with each other and may make new plants which have more fruits on them.	This candidate has made a fair attempt at answering the first part of the question as to why the project has focussed on arid areas. However, there is less evidence of the possible advantages to the people living in this area. Candidates can be encouraged to annotate/underline/highlight the question to identify all aspects such as that shown below: Explain why the project has concentrated on the arid and semi-arid areas of the world and discuss the possible advantages for people living in these areas of maintaining such a seed bank.

7(a) State what is meant by the term *non-infectious disease*.

[1]

Candidate style answer	Examiner's commentary
This is a disease that cannot be caught by another person	This is incorrect. It is a common colloquial answer which implies a misunderstanding of the term 'pathogen'

(b) Type 2 diabetes is also known as non-insulin dependent diabetes. The rise in the number of cases of Type 2 diabetes could be measured using the <u>incidence</u> of the disease or the <u>prevalence</u> of the disease.

Explain what is meant by the terms *incidence* and *prevalence*.

(i) incidence

[2]

Candidate style answer	Examiner's commentary
This is the number of new people who have the disease	Basic marks would be awarded. The candidate should have used the number of marks available as a guide to the level of detail

	required in the answer.

(ii)   prevalence

[1]

Candidate style answer	Examiner's commentary
This is the total number of people who have the disease	Basic marks would be awarded. Again the candidate should have used the number of marks available as a guide to the level of detail required in the answer.

(c)   Suggest, <u>with reasons</u>, which of the two methods of measuring the number of cases (incidence or prevalence) would be of most use in planning future health care provision for people with Type 2 diabetes.

[3]

Candidate style answer	Examiner's commentary
The best data would be prevalence. I think this because it means doctors and nurses will know exactly how many people have the disease and so they will know how many beds they will need and how much medicine they will need to be able to treat people. This is very important with Diabetes as it is a disease for life and so the people will need to be treated all of their life and this will cost the NHS a lot of money and the government will need to know how much they will need in the future.	Some marks can be supported for the reference to cost implications and the reference to the fact that Diabetes is a long term condition. The candidate could have gained 4 higher mark by extending the detail on the type of condition i.e. potentially chronic/debilitating etc

(d)   State <u>two</u> differences between Type 1 and Type 2 diabetes,

[2]

Candidate style answer	Examiner's commentary
1 Type 1 happens in young children but type 2 is in adults. *2 Type 1 can be treated with insulin but with type 2 you can just be careful with your diet*	This answer is supported. Further detail comparing the types of diet and lifestyle could have been included. Websites such as **http://diabetes.niddk.nih.gov/dm/pubs/type1and2/index.htm** can be used by students for independent research and revision activities such as web hunts.

(e)   The health of people with Type 2 diabetes is managed by a team of health professionals

      Suggest the role of the dietician in the management of Type 2 diabetes.

[3]

[Total: 13]

[Paper Total 100]

Candidate style answer	Examiner's commentary
It is important that people with type 2 diabetes see a nurse regularly so they can have their weight checked regularly. The nurse will also be able to	The use of the key term 'balanced diet' would have enabled the candidate to gain a higher mark.

tell them what type of thing to eat such as less fat and less calories.	

Overall Banding: Medium

Overall Comments: This candidate has gained a mark typical of a middle ability candidate. The main area for improvement is to encourage the correct use of more specific key terms. Whilst in several questions the candidate has clear ability and understanding it is their expression and use of colloquial language which has limited the overall mark. The production of glossaries at the end of each module, which can then be assembled into a unit revision pack, will help identify the key terms needed in each topic.